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EXAMINER	
NGUYEN, N	
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Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No. 09/293,216	Applicant(s) GALLIGAN et al	
	Examiner N. M. NGUYEN	Group Art Unit 1754	

—The MAILING DATE of this communication appears on the cover sheet beneath the correspondence address—

Peri d for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE three (3) MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, such period shall, by default, expire SIX (6) MONTHS from the mailing date of this communication .
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).

Status

☒ Responsive to communication(s) filed on May 24, 2001.

☒ This action is **FINAL.**

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle,* 1935 C.D. 1 1; 453 O.G. 213.

Disposition of Claims

☒ Claim(s) 22-33, 40-47 is/are pending in the application.

Of the above claim(s) ______ is/are withdrawn from consideration.

☐ Claim(s) ______ is/are allowed.

☒ Claim(s) 22-33, 40-47 is/are rejected.

☐ Claim(s) ______ is/are objected to.

☐ Claim(s) ______ are subject to restriction or election requirement.

Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ Th proposed drawing correction, filed on ______ is ☐ approved ☐ disapproved.

☐ Th drawing(s) filed on ______ is/are objected to by the Examiner.

☐ Th specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

Pri rity under 35 U.S.C. § 119 (a)-(d)

☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 11 9(a)-(d).

☐ All ☐ Some* ☐ None of the CERTIFIED copies of the priority documents have been

☐ received.

☐ received in Application No. (Series Code/Serial Number)______.

☐ received in this national stage application from the International Bureau (PCT Rule 1 7.2(a)).

*Certified copies not received:______.

Attachment(s)

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). ______

☒ Notice of R ference(s) Cited, PTO-892

☒ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Interview Summary, PTO-413

☐ Notice of Informal Patent Application, PTO-152

☐ Oth r______

Office Acti n Summary

DETAILED ACTION

The disclosure is objected to because of the following informalities: on page 16, the first full paragraph has been amended to state that "[B]y comparison, photomicrographs of a foamed metal substrate taken at corresponding magnification ... onto a substrate as taught herein". However, since the original Figures 2A-2D, which are supposed to be the above mentioned photomicrographs, were not included, it is unclear how the above statement can be verified.

Appropriate correction is required.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless --
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 22-25, 46 are rejected under 35 U.S.C. 102(b) as being anticipated by Ishida et al (4,455,281).

Ishida et al discloses a plate-shaped catalyst unit for NO_x reduction of exhaust gas (note title). The catalyst unit is produced by a method comprising the steps of spraying molten metal upon the surfaces of a metal plate to allow the molten metal to accumulate thereon to form rough surfaces and depositing a catalyst containing titanium and at least another catalytic material for

NO_x reduction of exhaust gas onto said rough surfaces whereby the catalyst is firmly secured on said rough surfaces (note claim 1). Ishida '281 further discloses that forming the surfaces of the metal plate into rough surfaces is effected by molten metal spraying. In the typical case, a metal wire is heated to be molten by contact resistance of electricity, an electric arc or high temperature flames, and molten metal thus obtained are sprayed together with gas such as compressed air through nozzles on the surfaces of the metal plate in the forms of very small droplets of molten metal allowing the molten metal to solidly secured thereto. As the molten metal sprayed, the same type of material as the metal plate is preferred. Then a catalytic substance is attached onto the surfaces of the metal plate formed into rough surfaces by the molten metal spraying (note column 4, line 62 to column 5, lines 13). The rough surfaces as disclosed in Ishida '281 is considered the same as the claimed "irregular surface configuration" in the instant claim 25. The catalytic substances are mixed in the form of particles at the predetermined ratio of composition, kneaded together with a suitable binder, and either coated on the surfaces of the metal plate in the state of paste or coated on the surfaces of the metal plate by dipping the metal plate in a slurry of the catalytic substances (note column 5, lines 24-30). This method is not an electric arc spraying method, as required by the instant claim 23.

Ishida '281 further discloses that the catalytic substances are mixed in the form of particles with a suitable binder. An inorganic fibrous filler material may be mixed with the paste or slurry so as to further improve adhering property of the catalyst to the surfaces of the metal plate. As the examples of such fillers, heat resistant and corrosion resistant materials such as glass fibers

(i.e. silicon oxide), etc. can be used (note column 5, lines 24-41). The filler is considered the same as the claimed refractory metal oxide support.

As shown in Figures 5 and 6, the expanded metal is considered the same as the required "open carrier substrate of reticulate configuration" and the " monolithic honeycomb carrier substrate".

The catalyst of Ishida '281 anticipates the claimed catalyst.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 22-33, 40-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishida '281 in view of Fukui et al (5,569,455).

Ishida '281 discloses a process for making a catalyst unit for NO_x reduction of exhaust gas as stated above.

Ishida '281 discloses that the substrate can be thin steel plates, such as ASTM type 430, type 410, and type 304 (note column 4, lines 58-61) and as the molten metal sprayed, the same type of material of the metal plate is preferred (note column 5, lines 9-10). The amount of

aluminum and nickel in the molten metal sprayed as disclosed in Ishida '281, if not the same as required in the instant claims, can be optimized to provide the best results.

Ishida '281 does not specifically disclose the arc temperature, however, it would have been obvious to one of ordinary skill in the art at the time the invention was made to optimize the arc temperature in order to produce the rough surfaces as desired in Ishida '281.

In the event that Ishida '281 does not disclose a catalytic material comprising a refractory metal oxide support on which one or more catalytic components are dispersed, Fukui is applied as stated below.

Fukui '281 discloses a method for making a catalytic bonding layer on carrier structures (note abstract). The catalyst is used to purify exhaust gas which contains noxious components such as HC, CO and NOx (note column 1, lines 18-24). After the bonding layer has been formed on the carrier structure, the upper surface of the bonding layer was impregnated with porous alumina and the layer was dried and sintered to form a catalyst carrier layer consisting mainly of porous alumina. This catalyst carrier layer was made y competitive adsorption to carry catalytically active components. Subsequently, the layer was dried, sintered, and activated (or reduced), yielding catalyst layer in finished form. Fukui '281 further discloses that the substrate can be honeycomb metallic substrate (note claim 8).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to form the catalyst layer in Ishida '281 by the process suggested by Fukui '281 because such catalyst layer is desired in an analogous application and to use a honeycomb (which

is considered the same as the claimed "foam") substrate as suggested by Fukui '281 to improve the surface area of the formed catalyst.

For the instant claims 27, 40-44, Ishida '281 discloses that the catalyst unit as described above is incorporated in a catalytic reactor, as shown in Figure 1, which has an inlet and an outlet and have plurality of fluid flow path therebetween.

Claims 22-30, 40-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gorynin et al (5,204,302) in view of Rondeau (4,027,367) and Ishida '281.

Gorynin '302 discloses a catalyst comprising a metallic substrate; an adhesive sublayer diffusion bonded onto said substrate; and a catalytically active layer deposited on said sublayer and a porous layer deposited on said catalytically active layer (note claim 1). The adhesive sublayer is prepared from thermally reactive powders, such as those prepared from nickel and titanium, aluminum with at least one or more of Co, Cr, Mo, Ta, Nb, Ti or Ni or silicon with at least one or more of Ti, Nb, Cr, W, Co, Mo, Ni or Ta (note column 2, lines 25-35). For the composition of the Ni alloy used, it would have been obvious to one of ordinary skill in the art to optimize such composition to obtain the best adhesive layer.

Gorynin '302 further discloses that the catalyst can be used for the purification of waste gases from an internal combustion engine (note column 1, lines 6-10). The examiner takes Official Notice that it is well known in the art to install an exhaust treatment apparatus which

contains a catalyst member within the apparatus after the internal combustion engine in order to purify the exhaust gas from such engine.

The adhesive layer in Gorynin is formed by plasma spraying. The thermally reactive powders is introduced into a plasma torch and an exothermic reaction is initiated in the torch. The exothermic powders impinge the substrate where the reaction continues. The heat generated in the reaction causes diffusion of the sub-layer into the substrate resulting in a diffusion bond and strong adhesion of the sublayer to the substrate (note column 3, lines 6-15). Thus, Gorynin '302 fairly teaches that the plasma spraying process is used to obtain a diffusion layer which improves the bonding between the two layers.

The difference is Gorynin '302 does not disclose the use of electric arc to form the adhesive layer.

Rondeau '367 discloses a method of thermal spraying a substrate to deposit a self-bonding coating on such substrate, comprising supplying an electric arc thermal spray gun with a wire feed comprising an alloy of nickel and aluminum or titanium, and using such electric arc thermal spray gun, spraying said wire feed onto such substrate to coat the same thereby to establish diffusion bond between such coating and such substrate to provide a self-bonding coating on such substrate (note claim 1). Rondeau '367 discloses that several types of thermal spraying guns are available including combustion flame spray guns, e.g., the oxy-fuel gas type, plasma arc spray guns and electric arc spray guns. Combustion flame spray guns require a source of fuel, such as acetylene, and oxygen and the temperature produced therein are usually relatively low and often incapable of

spraying materials having melting points exceeding 5,000°F. Plasma arc spray guns are usually the most expensive type and they produce much higher temperatures than the combustion type, e.g. up to approximately 30,000°F. Furthermore, plasma arc spray gun require a source of inert gas, such as argon, for creation of the plasma, and the gas flow rate and electric power therefor require extremely accurate control for proper operation. On the other hand an electric arc spray gun simply requires a source of electric power and a supply of compressed air or other gas, as is well known, to atomize and to propel the melted material in the arc to the substrate or target (note column 1, lines 25-43).

In undertaking the method of Rondeau '367 a number of important advantages are realized over the prior art. Firstly, the process uses an electric arc spray gun, which is more economically operated than other thermal spray equipment. Second, the material to be sprayed is supplied as a wire, which is more convenient to use than powder. The wire may be thin strand all the way up to a relatively thick rod as long as it is suitable for spraying through an electric arc spray gun. Third, the wire is readily formed as an alloy of the two primary materials nickel and aluminum or nickel and titanium. Fourth, the cohesive, adhesive and hardness attributes of the coating on an article formed by the method of the invention are generally equivalent to or better than corresponding attributes for a coating on an article sprayed with powder using other thermal spray devices (note paragraph bridging columns 2-3).

Rondeau '367 can be further applied to teach that the wire alloy comprises a minimum of 93% nickel, from 4 to 5.2% aluminum, from 0.25 to 1.00% Ti (note column 4, lines 15-20).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to use electric arc spraying method, instead of plasma spraying, to form the adhesive layer in Gorynin '302, as suggested by Rondeau '367 because electric arc spraying method can form the same diffusion bond between the two layers but it would cost less plus the additional advantages as stated above.

Ishida '281 is applied as stated above to teach that it is known in the art to form an adhesive layer on a substrate of a catalyst by using electric arc spraying process before depositing the catalytic layer in order to form a catalyst that is highly resistant to peel off (i.e. better bonding) (note column 7, lines 62-67). Ishida '281 is also applied to teach that the catalyst is used in a catalytic reactor, as shown in Figure 1, which has plurality of fluid flow paths between an inlet and an outlet.

Claims 22-33, 40-47 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gorynin '302 in view of Rondeau '367, Fukui et al (5,569,455), and Ishida '281.

Gorynin '302 and Rondeau '367 are applied as stated above.

Optionally, Ishida can be applied as stated above.

The difference not yet discussed is Gorynin '302 does not disclose a ferritic steel foam.

Fukui '455 discloses an exhaust gas catalytic purifier comprising a housing containing: a catalyst carrier; a substantially uniform, electrically energizable bonding layer, wherein the bonding layer has a substantially uniformly formed, sufficiently rough surface to firmly bond a

catalyst thereto and wherein the bonding layer can be a carbide or a silicide, and a catalyst layer disposed on and firmly bonded to said rough surface of said bonding layer disposed away from said catalyst carrier (note claim 1). Fukui '455 discloses that the carrier can be a honeycomb metallic structure (note claim 8).

It would have been obvious to one of ordinary skill in the art at the time of the invention was made to use the stainless steel (i.e. ferritic steel) substrate material as disclosed in Gorynin '302 in a honeycomb structure, as suggested by Fukui '455 because for a catalyst used in a catalytic purifier (i.e., catalytic converter), higher surface area is desired and a honeycomb structure (which is considered the same as the claimed "foam") would increase the surface area for the catalyst.

Claims 40, 44 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gorynin et al (5,204,302) in view of Ishida et al (4,455,281).

Gorynin is applied as stated above. Gorynin uses plasma spraying method to form the anchor layer.

The difference is Gorynin '302 does not discloses the step of reshaping the substrate to conform to the container.

Ishida '281 is applied as stated above to teach the use of the catalyst in a catalytic reactor.

Applicant's arguments filed May 24, 2001 have been fully considered but they are not persuasive.

Applicants urge that the original Figures 2E, 2F and 2G, now renumbered as Figures 2A, 2B and 2C, show the same type of roughened surface attained by electric arc-spraying as did the original Figures 2A-2C.

Even if the now renumbered Figures 2A-2C (originally, Figures 2E-2G) may show the roughnened surface attained by electric arc-spraying, they still were not "taken at *corresponding* magnification levels after an anchor layer has been electric arc sprayed thereon...".

Applicants urge that "layers of catalytic substances disposed at opposites sides of the metal plate are jointed to each other through perforations".

It should be noted that Applicants' claims only require that an anchor be deposited on a carrier and a catalyst layer be deposited on the anchor layer. There is no other requirement, excluding the joining of the catalyst layers on opposite sides of the carrier.

Applicants argue that Ishida '281 does not disclose or suggest the application of an electric arc-sprayed metal layer upon a carrier substrate of reticulate configuration as now defined in claim 22.

"Reticulate" configuration is a configuration resembles a network, and as shown in Figure 5 of Ishida '281, the expanded metal does resemble a network, therefore, it is considered as having a "reticulate" configuration, especially when "reticulate configuration" includes both woven and non-woven mesh (note Applicants' response filed May 24, 2001, page 6, third full

paragraph). Applicants have not provided any evidence or reason to show that the substrate, such as the one shown in Figure 5 of Ishida '281) is not a substrate having "reticulate configuration" or "honeycomb monolithic" structure.

Applicants argue that the bonding layer in Fukui '455 is formed on the ceramic carrier by chemical vapor deposition.

Granted that is true, Fukui '455 still fairly suggests that a carrier (honeycomb included) which is made of ceramic can be used instead of a metal carrier (note claims 3, 6 and 8) in a catalyst for removing NO_x. Since the carrier in Ishida '281 is also used for removing NO_x, it would have been obvious to one of ordinary skill in the art to use a ceramic carrier, as suggested by Fukui '455. Fukui '455 is not applied to teach the method of forming the anchor layer.

Applicants argue that Rondeau '367 does not disclose the use of thermal spraying method to form an anchor layer for catalytic materials.

The use of thermal spraying method as disclosed in Rondeau '367 should not be limited to just the exemplified uses mentioned in Rondeau '367, note the phrase "many other purposes". The motivation to combine Gorynin '302, Rondeau '367 and Ishida '281 is stated in the above rejection.

Applicants argue that Rondeau '367 teaches away from the claimed invention because Rondeau '367 is critical of low-temperature applications, such as combustion flame spray guns, because "the temperatures produced therein are usually relatively low and often incapable of

spraying materials having melting points exceeding 5000°F" while in Applicants' claimed invention, the temperature of the molten feed stock is not more than 5000°F.

It should be noted that the disclosure regarding the combustion flame spray guns, as stated in Rondeau '367, is to point out that such process is not capable of spraying materials having high melting point. However, this does not in any indicate that the electric arc spraying process of Rondeau '367 must be carried out at high temperature. Even though the process of Rondeau '367 is capable of spraying high melting point material, but the temperature of the process of Rondeau '367 would be depended on the material to be deposited, when Al and steel are the materials to be deposited, the temperatures are 950 and 1200°F (note Example VI) .

Applicants argue that Gorynin '302 emphasizes that the high temperature attained by plasma arc spray techniques is what "causes diffusion of the sublayer into the substrate, resulting in a diffusion bond and strong adhesion of the sublayer to the substrate", thus, in order to modify Gorynin '302 by the electric arc spray teaching of Rondeau '367, one must contravene the explicit teaching of Gorynin '302 that the high temperature attained by plasma spraying.

As stated by Applicants, in Gorynin '302, the goal is to obtain a "strong adhesion" of the sublayer to the substrate, and such strong adhesion is obtained by the diffusion caused by the high temperature plasma spraying. However, as suggested by Rondeau '367, not only the electric arc method can be more economically operated, but the cohesive adhesive and hardness attributes to the coating on an article formed by this method are generally equivalent to or better than corresponding attributes for a coating on an article sprayed with powder using other thermal

spray devices (note paragraph bridging columns 2-3) (other thermal spray devices are previously discloses to include oxy-fuel gas type, plasma arc spray guns, etc., note column 1, lines 25-43). Thus, instead of using a plasma spraying process to obtain a good bond between the sublayer and the substrate through diffusion bonding as disclosed in Gorynin '302, it would have been obvious to one of ordinary skill in the art to use electric arc process, as suggested by Rondeau '367 to obtain a bonding which is equivalent to or better than a bonding obtained when plasma arc spraying process was used but with less cost and easier to operate.

Applicants again argue that Ishida '281 does not disclose that the substrate can be a web of a reticulate support or withing the gas flow passages of a honeycomb support.

This argument is not persuasive for the same reasons as stated above.

Applicants argue that there is no basis for the Examiner to contend that the honeycomb structure of the prior art is the same as a ferritic steel foam.

As defined in Hawley's Condensed Chemical Dictionary, 13th edition, metal foam is a cellular metallic structure, i.e. structure with cells. Since honeycomb structure has cells, it is considered the same as "foam".

Applicants argue that Fukui '455 utilizes chemical vapor deposition to apply the metal layer.

Fukui is not relied upon to teach the method to apply the metal layer. Fukui '455 is applied to teach the use of honeycomb structure, which is considered as the same as "foam", as the substrate.

The rejection of claims 40 and 44 over Gorynin '302 in view of Ishida '281 is maintained for the same reasons as stated above.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Ngoc-Yen Nguyen whose telephone number is (703) 308-2536. The examiner is currently on a part time schedule.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Steve Griffin, can be reached on (703) 308-1164. The fax phone number for this Group is (703) 872-9311 (for OFFICIAL After Final amendment only) or (703) 872-9310 (for all other OFFICIAL faxes). UNOFFICIAL fax can be sent to (703) 305-6078.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the Group receptionist whose telephone number is (703) 308-0661.

N. M. Nguyen
August 13, 2001

Ngoc-Yen Nguyen

N. M. Nguyen
Primary Examiner
Art Unit 1754